

A SURVEY OF THE APHODIINAE, HYBOSORINAE AND SCARABAEINAE (COLEOPTERA: SCARABAEIDAE) FROM SMALL WET FORESTS OF COASTAL NEW SOUTH WALES. PART 1: NOWRA TO NEWCASTLE

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Abstract

Records of Aphodiinae, Hybosorinae and Scarabaeinae taken at spatially-limited wet forests between Nowra and Newcastle on the New South Wales coast are listed. Data include dates of collection, numbers of individuals encountered, bait types or collection method used, vegetation type, soil type and groundcover.

Introduction

This paper records results from a survey of small wet forest sites between Nowra and Newcastle on the New South Wales central coast; and represents part of a larger study of such habitats between Nowra and the Queensland border.

Recent revisions of the Australian Scarabaeinae by Matthews (1972, 1974 and 1976) provide a reliable framework for the determination of native species. The revisions also indicate a basic correlation of the fauna with vegetation and soil types and provides a distributional "over-view" of the fauna from surveys of major sclerophyll forests and rainforests of the eastern coast (Matthews *loc. cit.*). In general, spatially-limited wet forests of the central and northern New South Wales coast have been excluded from Matthew's distributions.

We were interested in establishing a faunal inventory of these sites to provide some insight into their possible role as species refuges and corridors of dispersal between more extensive areas of similar vegetation. Hybosorinae and Aphodiinae were included as they form, with the Scarabaeinae, a group which can be basically perceived as constituting complementary elements within the decomposer fauna of wet forest systems. We confined our attention to gully rainforest, small escarpment and summit stands of rainforest and wet sclerophyll forest and remnant tracts remaining after extensive land clearing. Larger wet forest tracts were included where these did not appear to have been recorded in Matthews (1972, 1974, 1976). The area under study contains a considerable number of small wet forests, mostly with a southern or south-eastern aspect, encompassed by drier sclerophyll forest as well as small patches of rainforest remaining after the clearing of the "Illawarra" and "Big Scrub" rainforests in the latter part of the 19th century.

Baited pit traps (Williams 1979) were placed at each site; normally three per visit. Not all members of the three subfamilies are attracted to excrement baits and so at some locations light trapping, litter sifting and observation of carrion and animal droppings, if present, were undertaken.

A map of study sites is given in Figure 1. Descriptions of site vegetation, soil type, ground coverage (leaf litter, ferns etc.), and distances, in a straight line, from Sydney are given in Table 1. A summary to species encountered is given in Table 2.

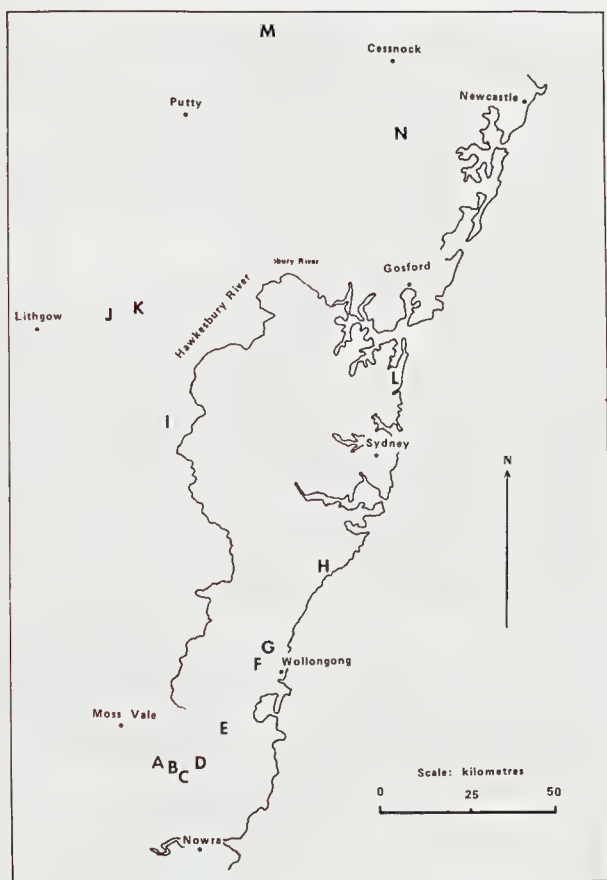


Fig. 1. Map of study sites: (A) Fitzroy Falls; (B) summit of Barrengarry Mountain; (C) eastern slope of Barrengarry Mountain; (D) upper Kangaroo Valley; (E) Macquarie Pass; (F) summit of Mt. Keira; (G) junction of Mt. Keira and Mt. Ousley roads; (H) Royal National Park; (I) Sassafras Gully; (J) Mt. Wilson; (K) Mt. Irvine; (L) Church Point, Ku-ring-gai Chase National Park; (M) Terrys Ck, Putty Rd; (N) Watagan State Forest, Bangalow Rd.

TABLE 1

List of study sites and species taken at each. Dates of collection are followed by figures in parenthesis indicating the number of specimens taken.

A. Fitzroy Falls, 110 km SW of Sydney between Nowra and Moss Vale. Gully restricted rainforest surrounded by low sclerophyll forest, dark brown loam soil.

Aphodius sp. 1.—13.i.1977, (1), under bird droppings. Voucher specimen from study site C in A.N.I.C.

B. Summit of Barrengarry Mountain, 115 km SW of Sydney between Nowra and Moss Vale. *Syncarpia* dominated wet sclerophyll forest, open grass and shrub cover, loam soil.

Aulacopris reichei White.—30.i.1978, (1), at faeces, a light was also operating on this night.

Lepanus illawarrensis Matthews.—18.ii.1978, (3), at faeces.

Onthophagus macrocephalus Kirby.—31.xii.1978, (1); 30.i.1978, (1), at faeces.

Onthophagus nurubuan Matthews?—18.ii.1978, (1), at faeces.

Onthophagus sydneyensis Blackburn.—31.xii.1978, (2); 30.i.1978, (1), at faeces.

C. Eastern slope of Barrengarry Mountain, 115 km SW of Sydney. Escarpment rainforest, open forest floor, heavy rock and leaf litter cover, shallow brown loam soil.

Aphodius tasmaniae Hope.—29.i.1977, (6), at light.

Aphodius sp. 1.—29.i.1977, (2), at faeces. Voucher specimen in A.N.I.C.

Liparochrus sculptilis Westwood?—29.i.1977, (2); 31.xii.1977, (1); 30.i.1978, (1), at faeces.

Amphistomus speculifer Matthews.—13.i.1977, (5); 30.i.1977, (2); 30.i.1978, (3), at faeces and fresh chicken bones.

Aulacopris reichei White.—13.i.1977, (1), at faeces.

Lepanus bidentatus (Wilson).—13.i.1977, (2), at faeces.

Lepanus illawarrensis Matthews.—13.i.1977, (5); 30.i.1977, (3); 31.xii.1977, (8); 30.i.1978, (3); 27.i.1979, (5), at faeces.

Onthophagus longipes Paulian.—30.i.1977, (1); 31.xii.1977, (1), at faeces.

Onthophagus pugnax Harold.—29.i.1977, (3); 31.xii.1977, (1); 27.i.1979, (2), at faeces.

Onthophagus sydneyensis Blackburn.—13.i.1977, (2); 30.i.1977, (6); 31.xii.1977, (5); 30.i.1978, (3); 18.ii.1978, (3); 27.i.1979, (4), at faeces, mushrooms and fresh chicken bones.

D. Upper Kangaroo Valley below Yeola, 110 km SW of Sydney. Gully rainforest within dry sclerophyll forest, rocky loam soil.

Aphodius tasmaniae Hope.—6.i.1979, (37), at light, probably attracted mainly from adjoining dry sclerophyll forest.

Amphistomus speculifer Matthews.—6.i.1979, (3), at faeces.

Onthophagus auritus Erichson.—6.i.1979, (2), at faeces, trap set very close to adjoining sclerophyll forest.

E. Macquarie Pass, 90 km SW of Sydney between Robertson and Albion Park. Rainforest with *Livistona* palms dominating border, open fern floor coverage, loam soil.

Amphistomus speculifer Matthews.—30.ix.1979, (4), at faeces and fresh chicken bones.

F. Summit of Mount Keira via Wollongong, 70 km S of Sydney. Wet sclerophyll forest, heavy plant and bark coverage of forest floor, loam soil.

Lepanus bidentatus (Wilson).—25.xi.1978, (5), at faeces.

Lepanus illawarrensis Matthews.—25.xi.1978, (3), at faeces.

Onthophagus bornemisszai Matthews.—24.xi.1978, (1), under horse droppings in forest clearing.

Onthophagus hoplocerus Lea.—25.xi.1978, (6), at faeces.

Onthophagus sydneyensis Blackburn.—25.xi.1978, (3), at faeces.

G. Junction of Mount Keira and Mount Ousley roads via Wollongong, 65 km S of Sydney. Rainforest disturbed by tree felling and pedestrian access, open forest floor, dark brown loam soil.

Cephalodesmius armiger Westwood.—25.xi.1978, (7); 30.ix.1979, (9), at faeces.

Lepanus illawarrensis Matthews.—25.xi.1978, (3); 30.ix.1979, (6), at faeces.

Onthophagus hoplocerus Lea.—25.xi.1978, (6); 30.ix.1979, (3), at faeces.

Onthophagus sydneyensis Blackburn.—25.xi.1978, (5); 30.ix.1979, (3), at faeces.

Onthophagus waterhousei Boucomont & Gillet.—30.ix.1979, (2), at faeces.

H. Royal National Park (S section of Couranga Track), 35 km S of Sydney. Gully rainforest within *Eucalyptus* and *Syncarpia/Livistona* dominated sclerophyll forest, heavy leaf litter and sandy loam soil.

Liparochrus sculptilis Westwood?—16.xii.1979, (1), at faeces.

Amphistomus speculifer Matthews.—27.x.1979, (2); 11.xi.1979, (2); 16.xii.1979, (3), at faeces.

Cephalodesmius armiger Westwood.—25.xi.1978, (3); 27.x.1979, (2); 13.xi.1979, (3); 16.xii.1979, (4), at faeces, at times entering adjoining *Syncarpia/Livistona* forest.

Lepanus bidentatus (Wilson).—27.x.1979, (1), at faeces.

Lepanus sp. near *pisoniae* (Lea).—25.xi.1978, (3); 30.ix.1979, (6); 27.x.1979, (1); 16.xii.1979, (5), at faeces. This is an undescribed species (Matthews pers. comm.). Specimens deposited in A.N.I.C.

Onthophagus bornemisszai Matthews.—12.xi.1979, (4), at faeces on border of rainforest gully and adjoining *Syncarpia/Livistona* forest.

Onthophagus pugnax Harold.—13.xi.1979, (6); 16.xii.1979, (1), at faeces.

Onthophagus sydneyensis Blackburn.—13.xi.1979, (3); 16.xii.1979, (4), at faeces. Taken also in adjoining dry forest on 27.x.1979, (1), but not in rainforest on that occasion.

I. Sassafras Gully via Springwood, 60 km NW of Sydney. Very open gully rainforest surrounded by severely burnt dry sclerophyll forest, sandy loam soil. Specimens recorded only from trap set adjacent to creek, no specimens encountered at traps placed away from creek (greater than 20 m) nor at trap set on rainforest/burnt dry sclerophyll margin.

Liparochrus bimaculatus Westwood.—26.xii.1979, (3), at faeces.

Lepanus australis Matthews.—26.xii.1979, (6), at faeces.

Lepanus bidentatus (Wilson).—26.xii.1979, (1), at faeces.

Lepanus sp. near *pisoniae* (Lea).—26.xii.1979, (7), at faeces. This species is that similarly noted from Royal National Park. Voucher specimens in A.N.I.C.

J. Mt. Wilson, 85 km NW of Sydney (3 sites); (1) "Cathedral of Ferns"; summit rainforest with heavy fern groundcover disturbed in sections by free-ranging stock, brown sandy loam; (2) "Happy Valley"; escarpment rainforest adjoining wet sclerophyll forest, open forest floor, dark loam soil; (3) "Zircon Creek"; gully rainforest, light brown loam soil.

Aphodius tasmaniae Hope.—21.i.1978, (1), at faeces, though common at light in adjoining open-floored sclerophyll forest.

Aphodius sp. 2.—5.i.1980, (26), only at faeces baited pit traps left *in situ* for five days. Not taken during extensive overnight trapping. Voucher specimen in A.N.I.C.

Liparochrus bimaculatus Westwood.—4.xii.1977, (4); 19.xi.1978, (3); 21.i.1978, (3); 26.xii.1979, (4); 5.i.1980, (1), at faeces and entering adjoining wet sclerophyll forest.

Lepanus bidentatus (Wilson).—22.i.1978, (7); 30.xii.1979, (4); 5.i.1980, (2), at faeces.

Lepanus illawarrensis Matthews.—22.i.1978, (3), at faeces, nine traps were set on this occasion. 19.xi.1978, (52); 26.xii.1979, (18); 27.xii.1979, (16), at faeces on rainforest/sclerophyll forest border ("Happy Valley" section.); 30.xii.1979, (11); at faeces. Specimens deposited in A.N.I.C.

Onthophagus capella Kirby.—5.i.1980, (1), at faeces but common at light in adjoining sclerophyll forest.

Onthophagus macrocephalus Kirby.—19.xi.1978, (1); 30.xii.1979, (1), at faeces.

Onthophagus sydneyensis Blackburn.—19.xi.1978, (11); 3.xii.1977, (6); 30.xii.1979, (5); 22.i.1978, (4); 5.i.1980, (6), at faeces, also entering adjoining wet sclerophyll forest.

K. Mt. Irvine, 80 km NW of Sydney (2 sites): (1) 0.6 km SE of "Irvineholme" (750 m alt.), wet sclerophyll forest, heavy fern coverage, loam soil; (2) "Sassafras" (750 m alt.), rainforest with conspicuous lianes, bare forest floor, loam soil. Rainforest at this site noticeably distinct from that of Mt. Wilson.

1. Wet sclerophyll forest.

Liparochrus bimaculatus Westwood.—12.i.1980, (1), at faeces.

Amphistomus speculifer Matthews.—5.i.1980, (8); 12.i.1980, (15), at faeces.

Aptenocanthos rossi Matthews (det. Matthews & Weir).—5.i.1980, (1), at faeces, in a section of the site distinguished by closely spaced trees of uniform narrow trunk girth with a low canopy.

Lepanus australis Matthews.—5.i.1980, (2), at faeces.

- Onthophagus capella* Kirby.—12.i.1980, (5), at faeces.
Onthophagus macrocephalus Kirby.—12.i.1980, (2), at faeces.
Onthophagus sydneyensis Blackburn.—5.i.1980, (3); 12.i.1980, (7), at faeces.

2. Rainforest

- Lepanus bidentatus* (Wilson).—12.i.1980, (1), at faeces.
Onthophagus capella Kirby.—5.i.1980, (2); 12.i.1980, (7), at faeces.
Onthophagus sydneyensis Blackburn.—5.i.1980, (2), at faeces.

L. Church Point, Ku-ring-gai Chase National Park, 25 km N of Sydney. Gully rainforest adjoining residential areas, heavy *Livistona* palm-leaf litter, very rocky, sandy loam soil.

- Lepanus australis* Matthews.—17.xi.1979, (1), at faeces.
Lepanus bidentatus (Wilson).—17.xi.1979, (1), at faeces.
Onthophagus sydneyensis Blackburn.—17.xi.1979, (1), at faeces.

M. Terrys Creek, Putty Road, 120 km NNW of Sydney. Extremely small section of gully rainforest (c. 20 m x 70 m), restricted to the northern side of gully, within dry sclerophyll forest, sandy loam soil, heavy leaf litter groundcover, heavy predestrian disturbance.

- Lepanus australis* Matthews.—1.x.1978, (1), in leaf litter.
Onthophagus pugnax Harold.—1.x.1978, (2), at faeces.

N. Watagan State Forest (Bangalow Road), 100 km NNE of Sydney. Gully rainforest within drier sclerophyll forest, light fern and leaf litter groundcover, dark brown-grey clay loam soil.

- Liparochnrus bimaculatus* Westwood?.—1.xii.1979, (1), at faeces.
Amphistomus speculifer Matthews.—1.xii.1979, (4), at faeces.
Cephalodesmus armiger Westwood.—1.xii.1979, (3), at faeces.
Onthophagus bornemisszai Matthews.—1.xii.1979, (8), at faeces.
Onthophagus pugnax Harold.—1.xii.1979, (1), at faeces.
Onthophagus rubicundulus Macleay.—1.xii.1979, (2), at faeces.
Onthophagus sydneyensis Blackburn.—1.xii.1979, (9), at faeces.

TABLE 2

Summary of species by subfamily (letters indicate sites)

Family SCARABAEIDAE

Subfamily APHODIINAE

Aphodius tasmaniae Hope.—C, D, J.

Aphodius sp. 1.—A, C.

Aphodius sp. 2.—J.

Subfamily HYBOSORINAE

Liparochnrus bimaculatus Westwood.—I, J, K (1).

L. bimaculatus Westwood?.—N.

L. sculptilis Westwood?.—C, H.

Subfamily SCARABAEINAE

Tribe ONTHOPHAGINI

Onthophagus capella Kirby.—J, K(1), K(2).

O. pugnax Harold.—C, H, M, N.

O. macrocephalus Kirby.—B, J, K(1).

O. hoplocerus Lea.—F, G.

O. nurubuan Matthews?.—B.

O. auritus Erichson.—D.

O. longipes Paulian.—C.

O. waterhousei Boucomont & Gillet.—G.

O. sydneyensis Blackburn.—B, C, F, G, H, J, K(1), K(2), L, N.

O. rubicundulus Macleay.—N.

O. bornemisszai Matthews.—F, H, N.

Tribe SCARABAEINI

Aulacopris reichei White.—B, C.

Cephalodesmius armiger Westwood.—G, H, N.

Amphistomus speculifer Matthews.—C, D, E, H, K(1), N.

Aptenocanthon rossi Matthews.—K(1).

Lepanus bidentatus (Wilson).—C, F, H, I, K(1), K(2), L.

L. australis Matthews.—K(1), M.

L. sp. near pisoniae (Lea).—H, I.

L. illawarrensis Matthews.—B, C, F, G, J.

Discussion

Several distribution records of interest arose from this study. *Onthophagus rubicundulus* had previously been recorded by Williams (1979) at Harrington over 100 km further north but the species is more commonly known from the New South Wales-Queensland border (Matthews 1972).

Matthews (1974) records one specimen of *Lepanus illawarrensis* from Mt. Tamborine, in Queensland, but otherwise states that the species is restricted to the dense escarpment forest from Wollongong south to Clyde Mtn. Our records of this species from Mt. Wilson represent a north-western extension to its main range. To date, we have not collected *L. illawarrensis* from any of our study sites north of Mt. Wilson.

Records of *Lepanus australis* lessen the gap between those of Matthews (1974) from southern New South Wales (Macquarie Pass) and that of Williams (1979) from the lower north coast of New South Wales (Harrington). We have also encountered this species near Bouddi National Park (east of Gosford) during March in sclerophyll forest growing on badly drained soil. This is one of two Scarabaeini, the other being *Amphistomus speculifer*, from this study area which do not appear to be restricted to wet sclerophyll or rainforests.

Our single record of *Aptenocanthon rossi* from Mt. Irvine was especially interesting as the species was previously known only from the female holotype collected from the "vicinity of Mt. Wilson". Pit trapping by us over a number of seasons at Mt. Wilson failed to locate additional examples.

It is interesting to note the high ratio of Scarabaeini to Onthophagini encountered (Table 2), both in species numbers and numbers of individuals present. Excluding any Hybosorinae or Aphodiinae that may have been present, at no site did the Scarabaeini fall below 40% of the scarabaeine species and individuals encountered and frequently constituted 60-70%. At Sassafras Gully the Scarabaeini were the only scarabaeines present on the single sampling made sharing the site only with one species of Hybosorinae. This disproportionate representation is in marked contrast to the results of surveys by Allsopp (1975, 1977) in rainforest at Ravensbourne, south-east Queensland, where out of a total of eighteen species of dung beetles taken by him thirteen were Onthophagini (genus *Onthophagus*) and one Coprini (genus *Notopedia*). The only *Onthophagus* ranging through most of our study sites was *O. sydneyensis* which also entered drier sclerophyll habitats.

Our species records from Macquarie Pass, Barrengarry Mountain and Mt. Keira are in accordance with those recorded by Matthews (1972, 1974) except for *Aulacopris reichei* which Matthews (1974) considered a rare species primarily associated with coastal *Casuarina* forest and sandy soil. Matthews (1974) does record *Lepanus politus* (Carter) from Macquarie Pass and Royal National Park, a species we have not encountered.

Our sampling experience has shown that spatially-limited wet forests are essentially "island-like" in regard to the dung beetle fauna found within them. We have found that such forest areas exhibit not only marked differences in the constitution of their faunas from adjoining habitats but also that differences can be expressed between the fauna of closely situated, but separated, wet forests. Of particular interest in this regard were our study sites at Mt. Wilson and Mt. Irvine. *Amphistomus specularifer* is a major element of the wet sclerophyll fauna at Mt. Irvine but was not encountered at Mt. Wilson. *Lepanus illawarrensis*, in contrast, dominated the wetter forest types at Mt. Wilson but was not trapped at Mt. Irvine.

We noted that low individual and species numbers in traps coincided with dry soil conditions within wet forests but to date we have not undertaken any definite measurements.

Although more extensive collecting may produce additional species records the list above (Table 1) demonstrates the impoverished nature of the region's fauna compared with that found further north along the eastern coast of Australia (c.f. Matthews 1972, 1974, 1976). However, the Scarabaeini are near their southern limit around the central coast of New South Wales and the Coprini have only one recorded representative, *Thyregeis kershawi* Blackburn, found south of Taree.

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References

- Allsopp, P. G., 1975. Dung beetles (Coleoptera: Scarabaeidae) collected in the Toowoomba district, south-east Queensland. *Aust. ent. Mag.* 2(3): 47-49.
- Allsopp, P. G., 1977. Further records of dung beetles (Coleoptera: Scarabaeidae) from the Toowoomba district. *Aust. ent. Mag.* 3(6): 101-103.
- Matthews, E. G., 1972. A revision of the Scarabaeine dung beetles of Australia. 1. Tribe Onthophagini. *Aust. J. Zool. Suppl. Ser.* 9: 1-330.
- Matthews, E. G., 1974. A revision of the Scarabaeine dung beetles of Australia. 2. Tribe Scarabaeini. *Aust. J. Zool. Suppl. Ser.* 24: 1-221.
- Matthews, E. G., 1976. A revision of the Scarabaeine dung beetles of Australia. 3. Tribe Coprini. *Aust. J. Zool. Suppl. Ser.* 38: 1-52.
- Williams, G. A., 1979. Scarabaeidae (Coleoptera) from the Harrington district of coastal northern New South Wales, with special reference to a littoral rainforest habitat. *Aust. ent. Mag.* 5(6): 103-108.